

those along its banks and on the islands in the stream. Even crows, unable to survive the cold, can be seen everywhere clinging frozen to the bare trees.—*Brooklyn Daily Eagle*, February 17, 1922.

*Italy*.—ROME, February 9.—The cold wave which is the severest in years, accompanied by a considerable fall

of snow, has forced a modification of the coronation ceremonies for Pope Pius XI, Sunday.—*New York Evening Mail*, February 9, 1922.

*Samoa*.—APIA, February 3.—The steamer *Suva* arrived at Suva after encountering a cyclonic storm early on Saturday.—*Samoa Times*.

## DETAILS OF THE WEATHER IN THE UNITED STATES.

### GENERAL CONDITIONS.

By A. J. HENRY.

Among the larger features of the month was the pronounced increase in the number and intensity of cyclonic storms which passed inland from the Pacific south of the mouth of the Columbia River. This movement in latitude was directly responsible for the increase in precipitation in California and perhaps in the Gulf and South Atlantic States. The mean temperature in Montana, the Dakotas, Wyoming, and Idaho was much below the seasonal normal, especially in Montana. East of the Mississippi, however, except for Wisconsin and a part of Minnesota, mean temperature was uniformly in excess of normal. The single event which stands out prominently in the month's weather was the fall of snow in the Plains States and the intense glaze storm in Wisconsin and Michigan during the last week of February.

### CYCLONES AND ANTICYCLONES.

By W. P. DAY, Observer.

Low-pressure areas were mostly of Pacific origin and their tracks covered a wide range in latitude. The high-pressure areas, however, which were mostly of the Alberta type, came in rapid succession and generally confined themselves to a well-marked path. The number of HIGHS plotted was considerably above the normal.

Tables showing the number of HIGHS and LOWS by types follow:

Lows.	Al- berta.	North Pa- cific.	South Pa- cific.	North- ern Rocky Moun- tain.	Colo- rado.	Texas.	East Gulf.	South At- lantic.	Central.	Total.
February, 1922...	2.0	6.0	2.0	.....	1.0	3.0	.....	2.0	.....	16.0
Average number 1892-1912, in- clusive.....	3.1	2.3	1.0	0.2	1.5	1.5	0.5	0.2	0.7	11.0

  

Higs.	North Pacific.	South Pacific.	Al- berta.	Plateau and Rocky Moun- tain region.	Hud- son Bay.	Total.
February, 1922.....	1.0	2.0	9.0	1.0	1.0	14.0
Average number, 1892-1912, inclu- sive.....	0.8	0.5	4.7	1.2	0.6	7.8

### FREE-AIR CONDITIONS.

By W. R. GREGG, Meteorologist.

For the month as a whole free-air temperatures were below normal in the Northern States and above normal in the Southern States, thus conforming quite closely to mean values at the surface. The largest negative departures occurred at Ellendale, being most pronounced in the lower levels and becoming rather steady at about  $-2.5^{\circ}$  C. above 1,500 meters. A similar though smaller decrease in departures in the upper levels was observed also at Drexel and Royal Center. The same tendency

is apparent in the values at Broken Arrow and Groesbeck, where temperatures were above normal at all levels, but increasingly so as greater altitudes were reached. In other words, owing to some widespread influence, the temperature decrease with altitude in all parts of the country was considerably less than normal, and hence the upper levels were warm as compared with those near the surface. Indeed, at Ellendale, where there is normally in February a practically isothermal condition from the surface to 2,000 meters above sea level, there was during the present month a large inversion, the recovery of temperature not taking place until an altitude of 3,000 meters was reached. At all stations conditions were more nearly like those usually found in December and January than those found in February. The cause is not far to seek. A glance at Chart IV will show that there was a larger latitudinal temperature gradient than normally occurs—a condition that would produce relatively low free-air pressures in the North and relatively high in the South, with a resulting larger south component or (what amounts to the same thing) a smaller north component in the winds. That this is what actually occurred is indicated by the values given in Table 2. The departures from normal were small, but in nearly all cases they were in the same direction, sufficiently so to cause the temperature anomalies referred to.

In general the changes in free-air temperature from day to day were in the same sense as were those at the surface. There were some exceptions, however, mostly associated with anticyclones in the northwest. These areas of high pressure are usually accompanied by clear weather, and radiation is very active. Not infrequently, as the center passes a given point and the wind shifts from northerly to southerly, the surface temperature remains low or even continues to fall. This tendency exists only in the lowest layers, usually within 200 to 500 meters of the surface. At higher levels the response of temperature to the wind shift is immediate and decided. A case in point occurred on February 19 to 20, during which period a moderate anticyclone moved almost due east from eastern Montana to Minnesota. Generally clear weather prevailed. At both Ellendale and Drexel the wind at all levels was NW. and fairly strong, and temperatures were low as the anticyclone approached. When the crest of the latter passed these stations the wind became SE. to SW. and of moderate strength, and the temperature in the free air therefore increased, but that at the surface continued to fall. The rise in temperature at the upper levels was not large, the wind changing only from NW. and WNW. to WSW. When the wind shifts through a larger angle the changes in temperature likewise become greater. For example, from February 6 to 7 the free-air wind backed from N. and NNW. to SW., the temperature meanwhile increasing about  $15^{\circ}$  C. This is the type of change that occurs above the surface, even though the reverse change occurs for a time at the latter, owing to radiation or to peculiar local effects of topography, etc. In this connection it is of interest to recall that the temperature distribution in winter cyclones in the extreme Northwest—near the Pacific—is usually quite the reverse